Coverage dependent supramolecular structures: 2D phases of C$_{60}$:ACA monolayers on Ag(111)$^1$ BO XU, CHENGGANG TAO, ELLEN WILLIAMS, JANICE REUTT-ROBEY, University of Maryland — The dependence of supramolecular structures on fractional molecular coverage in a 2-component adlayer has been investigated using scanning tunneling microscopy. A series of acridine-9-carboxylic acid (ACA) surface structures emerges sequentially when deposited on Ag(111) at room temperature. At low molecular coverage ($\theta < 0.4ML$), ACA forms a two-dimensional gas phase. Ordered ACA structures appear with increased coverage: firstly a chain structure composed of ACA molecules linked by O–H···N hydrogen bonds ($\theta > 0.4ML$), then a dimer structure composed of ACA dimers linked by carboxyl-carboxyl hydrogen bonds ($\theta \sim 1.0ML$). The structures of the C$_{60}$:ACA binary system depend on the coverage of pre-deposited ACA. When the initial ACA coverage is between 0.4 ML and 0.8 ML, subsequent C$_{60}$ deposition results in a hexagonal cooperative structure with C$_{60}$ period nearly three times as large as the normal C$_{60}$ 2-D packing of 1 nm, and exists in enantiopure domains. A C$_{60}$ quasi-chain structure is formed when the initial ACA coverage is above 0.8 ML. Parallel C$_{60}$ chains are separated in space by the ACA dimer structure. Chemically reasonable molecular packing model are presented based on the observed STM images.

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